DARPATech '97

Undersea Littoral Warfare

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Undersea Littoral Warfare

- **NetSAT** (Netted Search, Acquisition, and Targeting)**:** Enhance detection, classification, and targeting performance against low-observable submarines and mines in littoral areas.
- **Water Hammer:** Neutralize mines through the generation, focusing, and transport of a pressure pulse to tens of meters in shallow water.

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Netted Search, Acquisition and Targeting (NetSAT)

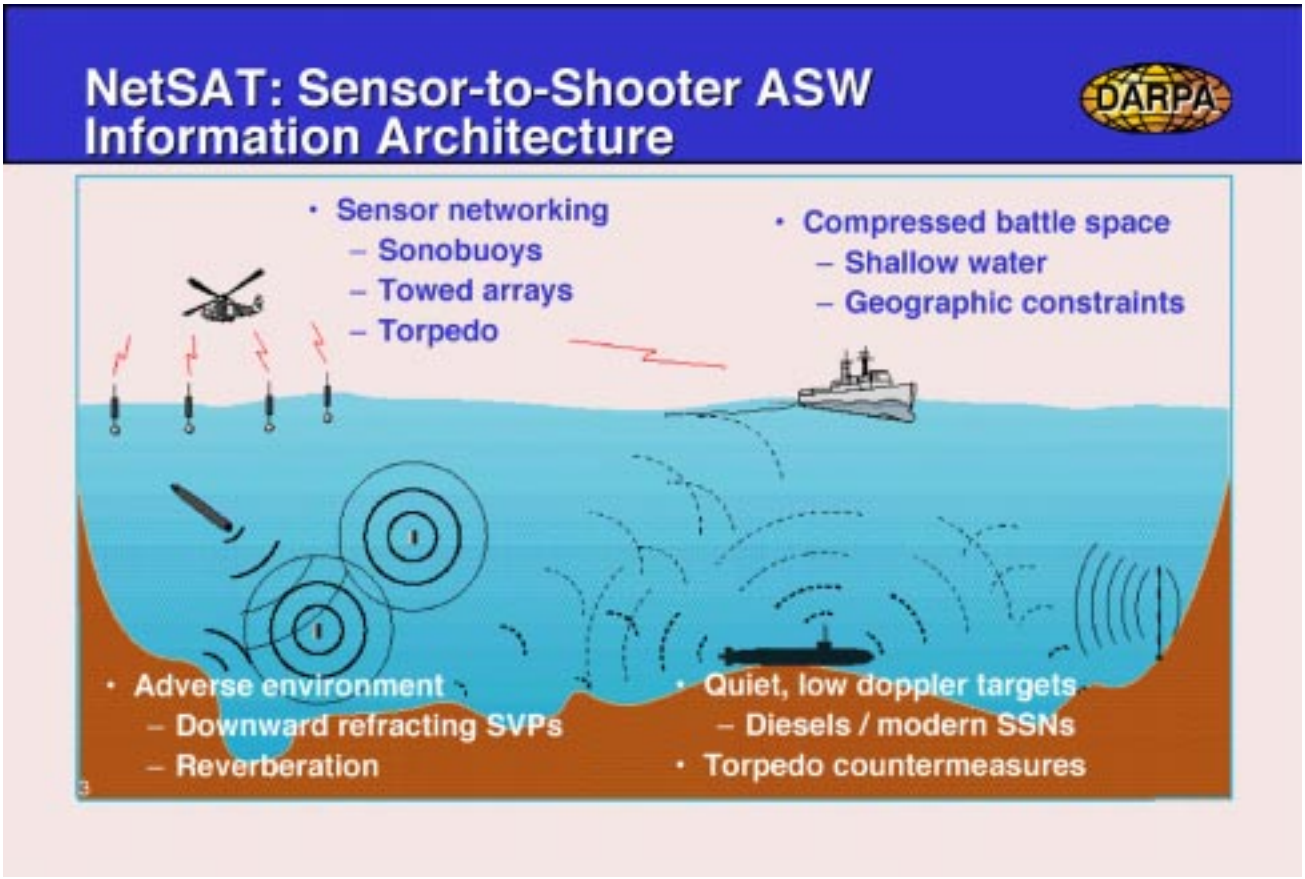
- Seamless source/receiver network from search through kill
- Detection at standoff
- 99% P_d, 1/1000 ping false alarm rate

Mine detection and classification

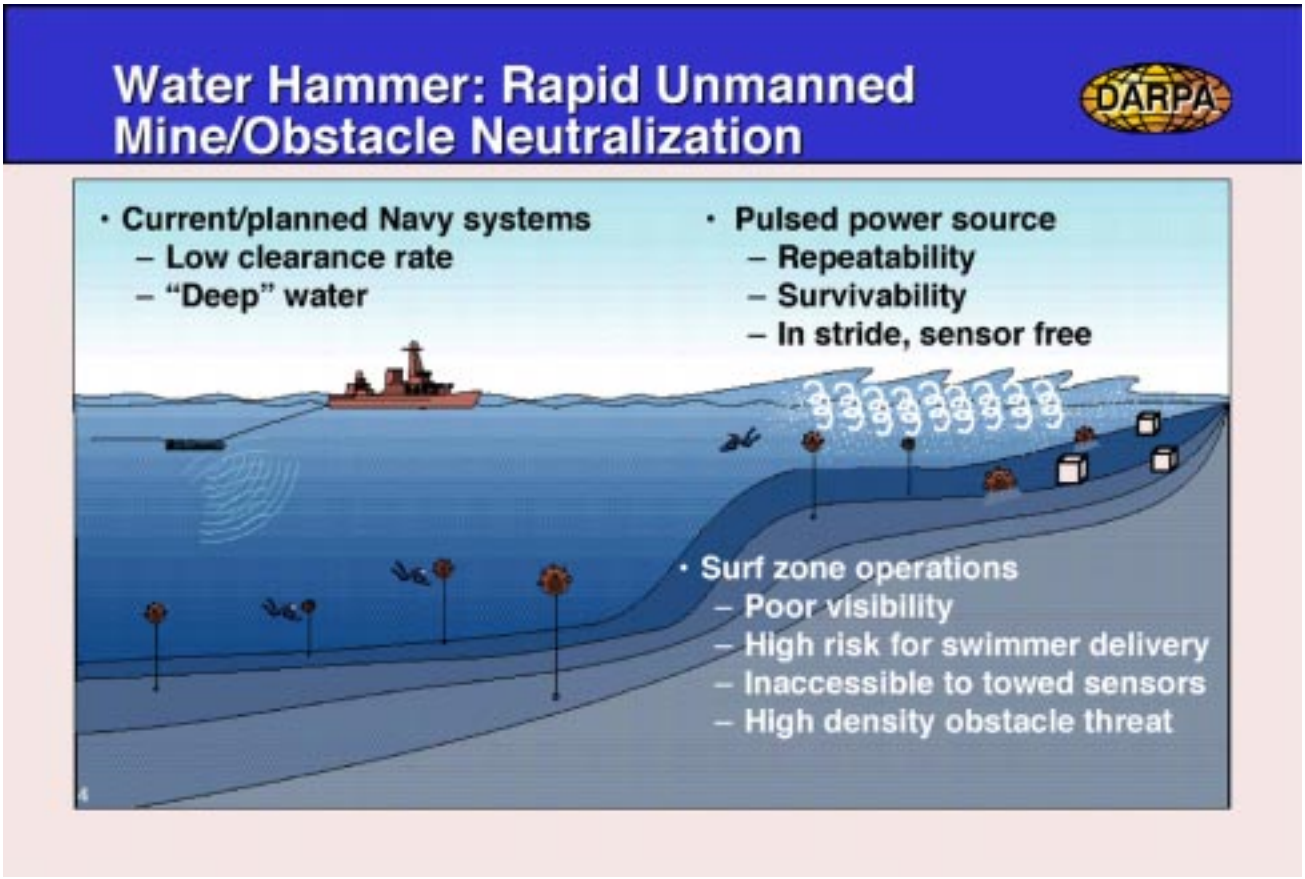
- High area search rate
- 10 cm resolution at 1 km

Mine neutralization (Water Hammer)

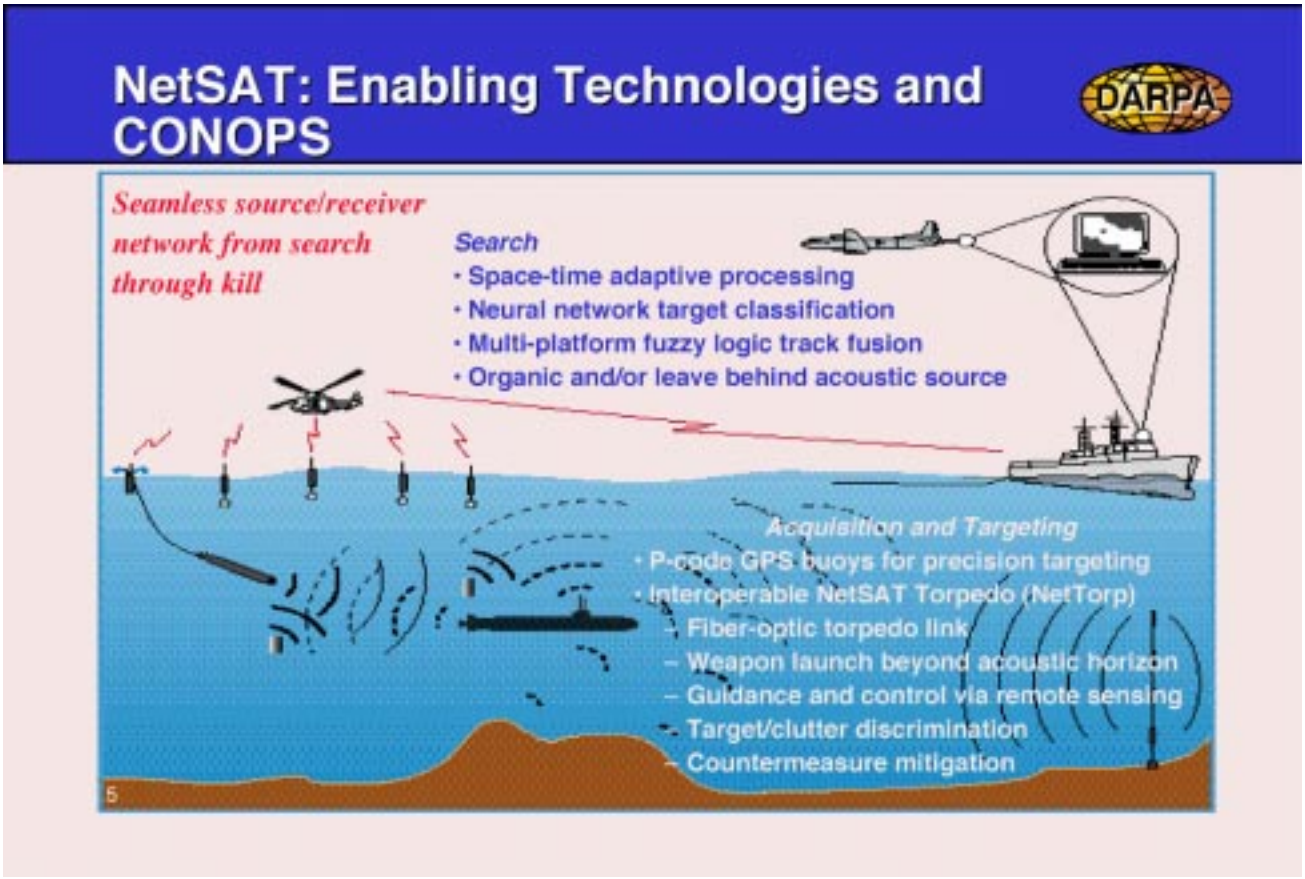
- Design, fabricate, and demonstrate a mine neutralization system for rapid, precision, in-stride lane clearance
- Develop a highly efficient, non-air-breathing, low form factor (16 kJ/g) acoustic shock wave source to generate and transport a pressure pulse with an impulse > 1000 psi-msec and peak pressure > 2000 psi to a target at a range of 20 m
- Focus energy on target
- Design to very shallow water, evaluate to other depths



The NetSAT program is attempting to resolve problems associated with warfighting in the littoral by creating an information exchange network that significantly improves target detection and kill probabilities. The network will include sonobuoy and surface ship towed array information, as well as torpedo acoustic data. Advanced signal processing techniques will be used to mitigate the effects of a compressed battlespace, adverse acoustic conditions, and quiet target platforms.



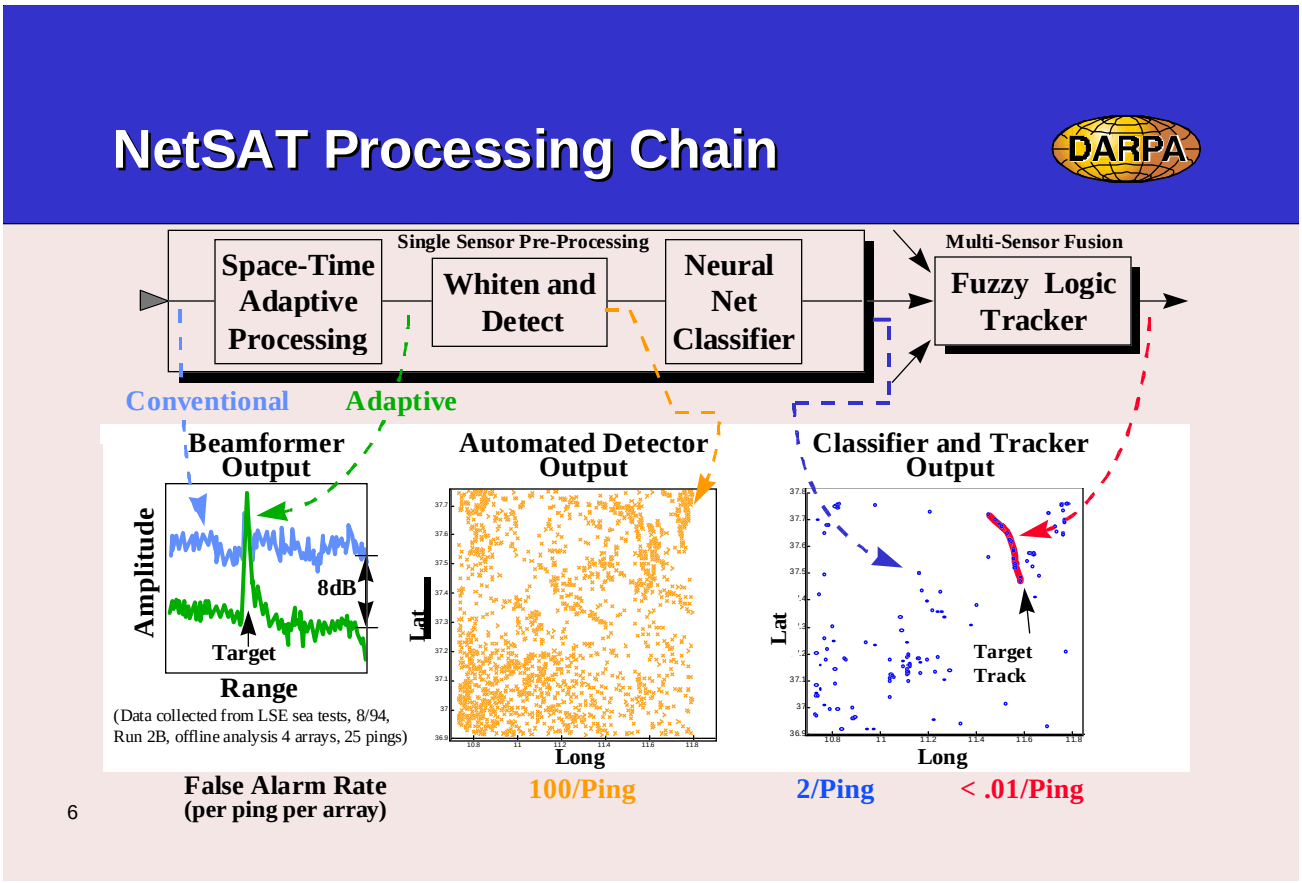
Planned Navy towed mine clearance systems are not capable of operating in very shallow water. Additionally, some systems require the use of divers to confirm the presence of a mine and/or to apply an explosive pack for mine destruction. The Water Hammer program will develop an autonomous system that includes a high energy density acoustic that can operate in the surf zone, with potential application to deeper water.



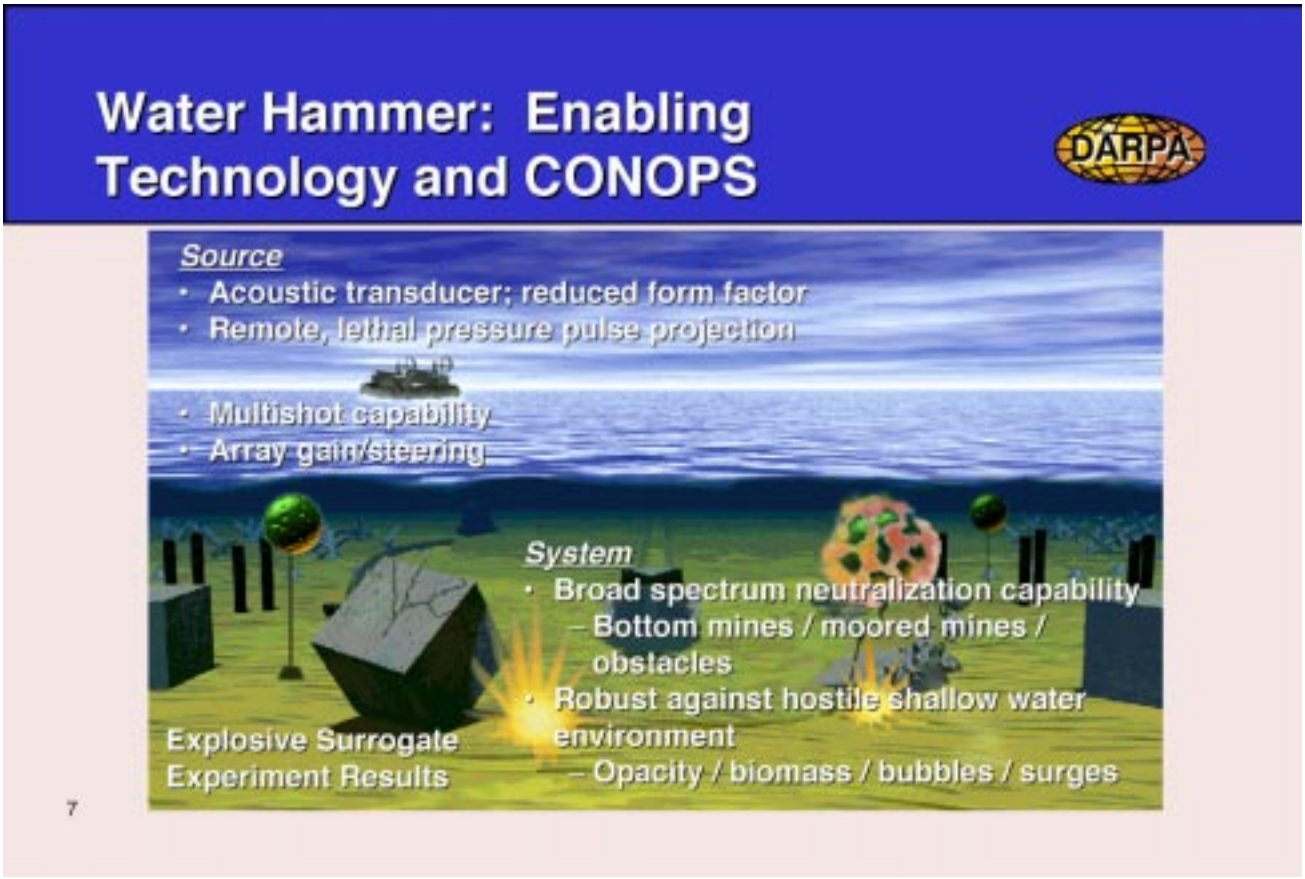
During the search phase, the NetSAT program will employ an active acoustic multistatic ASW prosecution scheme capable of detecting low or zero doppler submarine targets. Various advanced signal processing techniques will be used for detection and tracking. Low frequency organic or offboard acoustic sources will be used to activate the area of interest. These sources may be impulsive or controllable in nature.

During acquisition and targeting, an air-dropped torpedo will be linked to a surface buoy via an optical fiber, then RF linked to a host processing platform. Two-way high data rate communications will permit exchange of torpedo acoustic data and guidance and control information.

The intent of these efforts is to refine targeting performance such that weapon release criteria can be relaxed and the effects of acoustic countermeasures on torpedo performance can be mitigated, thereby improving probability of kill.

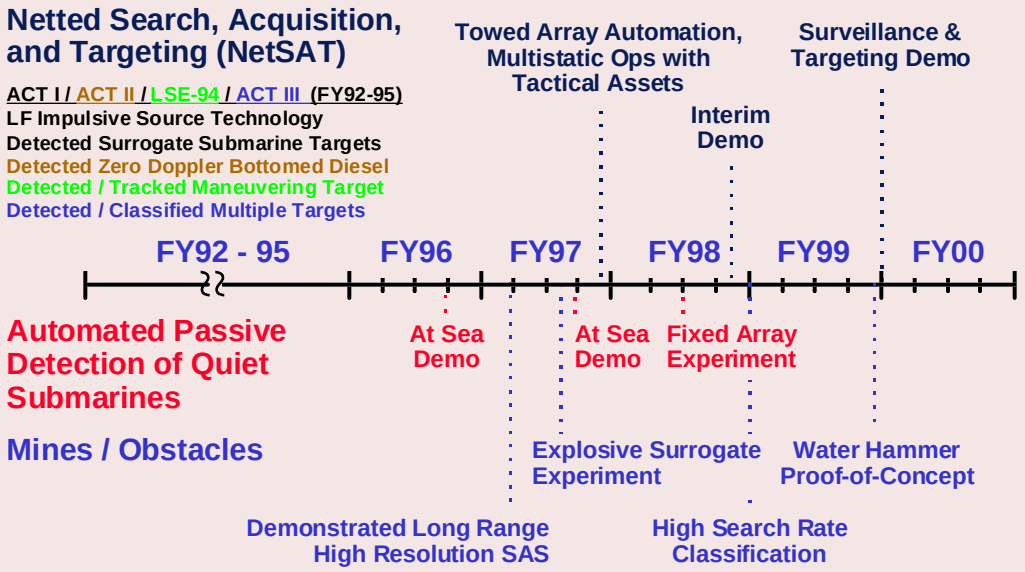


The signal processing chain consists of a series of stages, leading to an automated low false-alert high sensitivity tracker.



The Water Hammer program will attempt to neutralize mines through the application of a lethal pressure pulse to the hard body. The goal is the development of a sensor-free, in-stride mine/obstacle neutralization system. An explosive surrogate experiment was conducted with Mk6 mine shapes in May 1997 to assist in determining concept feasibility for Water Hammer. All mine shapes deployed in the test were crushed and flooded. This experimental success has permitted continued research. Later tests, using live mines, will determine whether the neutralization mechanism will be internal flooding or if sympathetic detonation is possible.

Undersea Littoral Warfare Results/Plans



Netted Search, Acquisition and Targeting (NetSAT)

- Advanced signal processing/sensor networking
  - Space-time adaptive processing
  - Fuzzy logic track fusion
- NetSAT torpedo (NetTORP)
  - Mk 46 torpedo modified with a two-way fiber optic data link to pass acoustic data and receive G&C commands
- Synthetic aperture sonar (SAS)
  - High area search rate
- Leverage current/legacy programs
  - Utilize existing performers
- FY99 system demonstration

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- Focus energy on target
- Design to very shallow water, evaluate to other depths
- Sole source concept development
- FY99 competition for prototype development